



HONOLULU

LA JOLLA

TIBURON

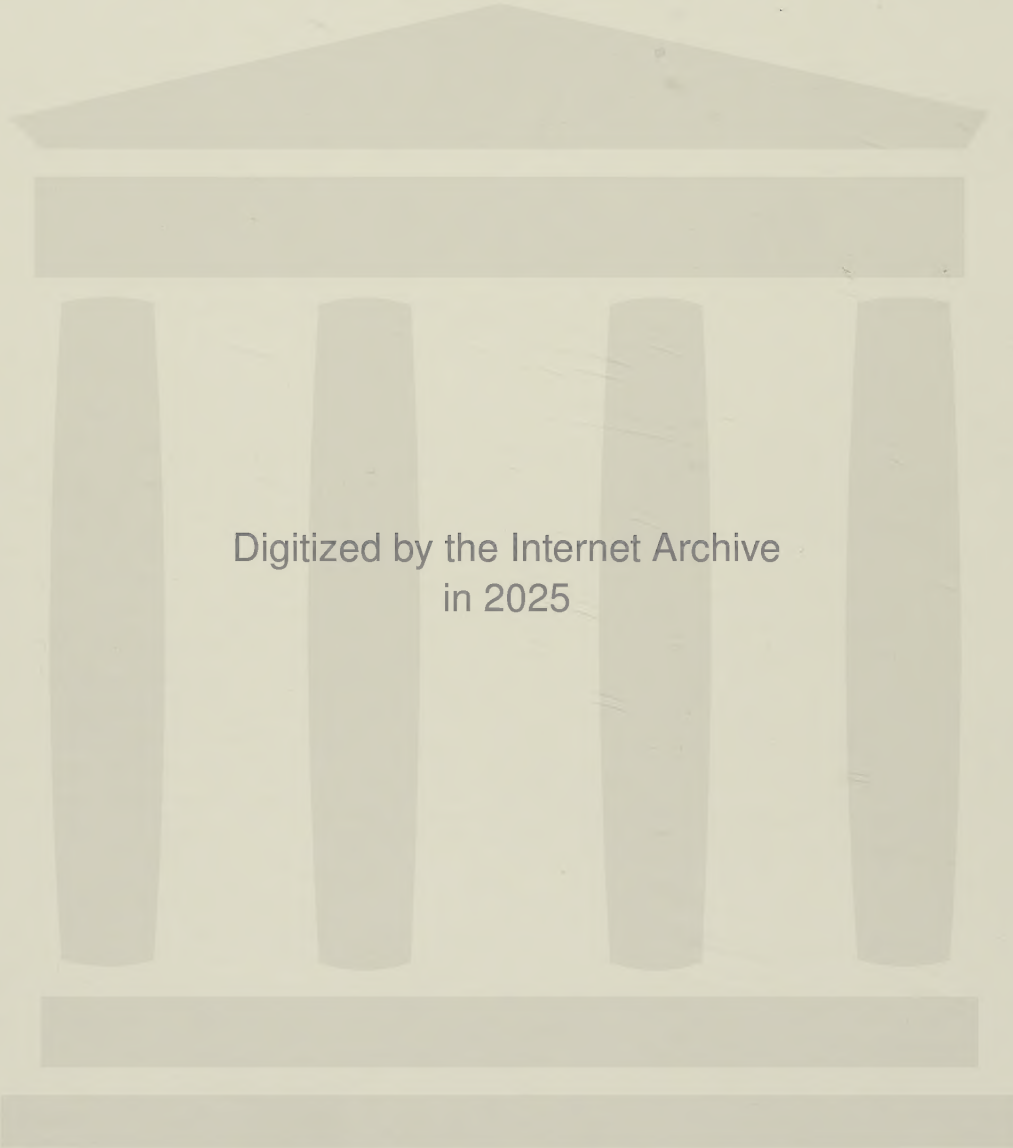
SWFC

SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - MAY AND JUNE 1976
RESEARCH HIGHLIGHTS

	Page
Publications	1
Implementation of Extended Jurisdiction and the SWFC	2
Concentrated Studies on Tuna Metabolism Begun by Visiting Scientists	3
Swimming Depths of Large Skipjack Tuna Monitored Successfully	5
1976 Albacore Forecast Estimates Half of Total Catch Will Be Taken South of San Francisco	8
Tuna Fishery Management Model Nears Completion	17
Final 1975 Atlantic Tuna Statistics Sent to ICCAT	18
NMFS Announces Porpoise Quota	20
Plans Made for Aerial Survey of Porpoises in Eastern Tropical Pacific	22
Preparations for Summer-Fall Rearing of Salmon Continue	27
NMFS Represented at Fifth Annual Fishermen's Festival	28
Tiburon Laboratory Hosts Multiple-Species Fishery Colloquium	30

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MONTHLY REPORT - MAY AND JUNE 1976

STATUS OF PUBLICATIONS

Published

Hunter, John R. (editor). 1976. Report of a Colloquium on Larval Fish Mortality Studies and Their Relation to Fishery Research, January 1975. NOAA Technical Report NMFS Circ-395, 5 p.

One of the critical problems in fishery research today is the inability to determine how the abundance of adult fishes affect the strength of incoming year classes. The report summarizes the discussions of experts on how studies of larval fish mortality may assist in solving this problem. Included in this report are discussions of the principle causes of larval mortality and their possible relation to stock size. Guidelines and recommendations are made regarding future research on the mortality of larval fish.

Smith, T. D. and W. F. Perrin. 1976. The whale problem. J. Mammal. (Book Review), 57 (2): 421-427.

Dizon, Andrew E., Thomas C. Byles, and E. Don Stevens. 1976. Perception of abrupt temperature decrease by restrained skipjack tuna, Katsuwonus pelamis. J. Therm. Biol. 1:185-187.

Decreasing temperature stimuli produced responses and threshold similar to those produced by increasing temperature stimuli in a previous study with skipjack tuna, Katsuwonus pelamis. Restrained skipjack tuna signaled by deceleration of heart rate that they could perceive abrupt temperature decreases (0.5°C/sec) as small as 1-2°C. Temperature stimulation of the oral-branchial cavity was more effective in eliciting responses than stimulation of the dorsal, anterior quadrant of the body surface.

This report does not constitute publication and is for information only.

Approved by Center Director

Kitchell, James F., John J. Magnuson, and William H. Neill. Estimation of caloric content for fish biomass. For publication in Environmental Biology of Fishes.

"Maturation and induced spawning of captive Pacific mackerel, Scomber japonicus Houttuyn" by Roderick Leong. For publication in the Fishery Bulletin, U.S.

"The transfer of the chlorinated hydrocarbon PCB in a laboratory marine food chain" by Edward D. Scura and Gail H. Theilacker. For publication in Marine Biology.

Eldridge, M.B., J.W. Struhsaker, and T. Echeverria. "Effects of benzene on the energetics of Pacific herring (Clupea harengus pallasii) embryos and larvae." For Trans. Amer. Fishery Soc.

James L. Squire, Jr. and Stuart N. Luttich. "Surface currents as determined by drift card releases over the continental shelf off central and southern California." For publication as a NOAA Technical Report.

EXTENDED JURISDICTION

Implementation of Extended Jurisdiction and the SWFC

With the passage of the Fisheries Management and Conservation Act (FMCA) and the potential impact of the Act at the Center, Acting Director Barrett has asked Mr. David Mackett, Planning Officer, to take whatever appropriate action must be taken here presently to insure that the transition period to the new fisheries management mode proceeds as expeditiously as possible. Acting in a staff capacity, Mr. Mackett will serve as a focal point for needed FMCA actions during the interim period of implementation.

Mr. Mackett will establish appropriate lines of communications with his Regional and State counterparts in respect to both the Pacific and Western Pacific Regional Councils and integrate the Center's extended jurisdiction activities with these and other involved agencies, constituents, and others. A brief monthly report on the Center's extended jurisdiction activities will be submitted each month to Mr. Donald Johnson, Director of the Northwest Region.

Preliminary Management Plans Being Prepared for Key Fishery Management Units

The Honolulu Laboratory is responsible for drafting preliminary fishery management plans as part of the preparatory work supporting the Western Pacific Regional Council. Three management units are being considered at this stage: 1) billfishes, 2) precious corals, and 3) seamount fishery resources.

The preparation of management plans is being coordinated by Dr. Jerry Wetherall, Fishery Biologist in the Tuna Assessment and Development Investigations.

The initial planning efforts involve assembling available fishery statistics and drafting descriptions of the management units, followed by detailed consideration of management objectives and alternative management policies. A series of local meetings have been scheduled to generate input from the Hawaii Division of Fish and Game and key constituents representing both commercial and recreational fishing interests.

The billfish management plan will cover billfish stocks and fisheries in the Pacific Regional Council area as well as in the region of the Western Pacific Council (Hawaii, American Samoa, and Guam). Thus, planning input is also being sought in this case from the California Department of Fish and Game, California billfish interests, and the Southwest Fisheries Center, La Jolla personnel. The California task is being coordinated by Mr. James Squire, Fishery Biologist, SWFC.

The precious coral and seamount resources management units refer only to the Western Pacific Region, and particularly the Hawaiian Archipelago. In these units a major problem is that harvest statistics are either very scanty (precious coral) and or completely unavailable (seamount resources, presently fished only by foreign fleets).

HONOLULU LABORATORY

FISH ENVIRONMENT INVESTIGATIONS

Concentrated Studies on Tuna Metabolism Begun by Visiting Scientists

Dr. Peter Hochachka and graduate students Michael Guppy and Chris French arrived from the University of British Columbia, Vancouver, for concentrated studies on tuna metabolism.

Studies on respiration of isolated preparations of skipjack red and white muscle have progressed rapidly. They now have the first definitive evidence that white muscle respiration is dependent upon the -glycerophosphate cycle. They have established conditions under which they can demonstrate the operation of the cycle and they now hope to study its regulation in multi-enzyme preparations. They have also established that the faster the fish moves, the more energy is produced aerobically by its white muscle (also, interestingly, the more energy is produced anaerobically by its white muscle!), and the more active the -glycerophosphate cycle.

Progress in studies of red and white muscle metabolites in quick frozen samples of skipjack tuna is also good. Dr. Hochachka and his students have extracted liquid N₂-frozen samples of muscle from skipjack tuna under a variety of metabolic states. Some measurements have already been done. For example, it is now known that in a tuna hooked on line and run to fatigue, white muscle lactate levels are as high as 100 mM (!), from levels that at the start must be in the 4 mM or less range. At the same time, as they anticipated from their model, -glycerophosphate levels do not rise above about 0.5 mM. The biggest stumbling block has been to obtain tissue samples from quiescent fish. A number of techniques have been tried; the most promising approaches at the moment include the spinal anima and the use curare (with the help of the Honolulu Zoo and its expertise with hypodermic-tipped spears).

Modeling of Tuna Energetics is Goal of Cooperating Scientists

During June much progress was made in defining energy transformations in skipjack tuna. The Experimental Ecology of Tunas group benefited greatly from the data, ideas, and discussions of several divergent groups of investigators who have worked with the group over the past 2 months.

Dr. Peter Hochachka and his associates, Mr. Michael Guppy and Mr. Chris French (University of British Columbia), have spent an intensive 2 months studying regulation of red and white muscle respiration in skipjack tuna (see previous section).

Dr. James Kitchell and Mr. Don Stewart (University of Wisconsin) have been working with their gaming model which describes energy flow within fish at various life stages. Inputs to their model include respiration data collected on captive fish and guesstimates of available food and activity levels; output is fish body growth, which is compared with otolith growth information.

Dr. Gary Sharp (IATTC) spent 3 days with members of the Experimental Ecology group discussing his heat conservation, heat production, and swimming energetics model.

At the moment there are some discrepancies between the various approaches. Decisions were made on testing captive tuna so that we can adjust the parameters of our models. Currently, Dr. Andrew Dizon, leader of the Experimental Ecology of Tunas group and Mr. Richard Brill of the University of Hawaii are determining stasis energy requirements (energy consumption of an animal at zero activity) for skipjack tuna; they are collecting data on body temperature and activity of fish swimming in specified temperature gradients. The former information is necessary for inputs to the energy models; the latter will be used to test Dr. Sharp's heat conservation and production models.

Essential to any model of energy flow in an animal is some idea of long-term activity. That is, the energy that is expended in feeding and migration, both vertical and horizontal. This type of information was collected on free-ranging, large (approximately 70 cm) skipjack tuna. Using ultrasonic transmitters implanted into the fish's stomachs, individual fish were followed and information on horizontal and vertical movements was collected. These movements translated into energy units and added to stasis requirements will provide a first estimate of the available calories that must be partitioned for activity and maintenance and which cannot go into growth.

Ambient temperature information is also available for the water traversed by the tracked fish. Barkley et al. (manuscript in preparation) have made predictions of tuna distribution based on ambient temperature, oxygen, and activity level parameters. The tracked fish swam somewhat faster than expected in water somewhat warmer than that predicted by the distribution model. Dr. Dizon will report on these data more fully next month.

The Experimental Ecology group continues to be frustrated in their attempts to induce forced swimming in tunas. They must collect information on respiration rates at higher than basal speeds and determine at what speeds white muscle becomes a significant contributor. These experiments require subjects that can be induced to maintain specified swim speeds. So far attempts by Ms. Sherry Steffel (University of Wisconsin) to chase tuna in an annular tank and Mr. Brill's attempts to use spinal stimuli in restrained fish have not been successful. More work is planned.

Swimming Depths of Large Skipjack Tuna Successfully Monitored

On June 9 the Townsend Cromwell returned from Cruise 76-04-71, the last 2 weeks of which were used for tracking large (> 70 cm fork length) skipjack tuna. The purpose for tracking was to obtain data on the activity-temperature regime of large skipjack tuna to determine its energy budget.

With excellent cooperation from the captain and crew of the F/V Anela, Research Assistant James Uchiyama tagged five large skipjack tuna from that ship. The fish were tagged with pressure sensing and reporting transmitters placed in their stomachs. Two fish regurgitated their tags. The other three fish were tracked for 11, 25, and 9 hours, respectively. The last fish sank below the range of the tag in 20 minutes; it is believed to have died. There was visual confirmation that the tagged fish had rejoined their schools. Generalizations from a preliminary examination of the results are:

1. 100-m changes in swimming depths were made readily in a couple of minutes.
2. Swimming depths of 270 m were reached occasionally; the deepest was 275 m.
3. At about 8 p.m. the fish rose to within 75 m of the surface and remained in that zone for at least 2 hours. The one fish that was tracked throughout the night remained in that zone until 5 a.m.
4. In the 2 to 4 hours before the 8 p.m. ascent the fish stayed at depths of 100 to 200 m.
5. The three tagged individuals were in temperatures of 20°C or greater roughly 50%, 90%, and 75% of the time, respectively.
6. The lowest temperature entered was 12.5°C.
7. Except for the last 5 hours of activity by the third tagged fish, the average swimming speed for the horizontal distances covered ranged from 1.7 body lengths/sec to 2.2 body lengths/sec (1.2 to 1.6 m/sec). These are minimum values from straight line calculations using positions of the ship at 30-m intervals.
8. The highest speed attained for a half-hour period was 4.3 m/sec (6.1 body lengths/sec).

A cruise report is now being prepared by Mr. Heeny Yuen, Leader, Recreational Fisheries, and Chief Scientist for Cromwell Cruise 71.

TUNA ASSESSMENT AND DEVELOPMENT INVESTIGATIONS

Threadfin Shad Collected and Transported to Kewalo Facility for Acclimation to Sea Water Followed by Voyage to Guam

On May 25 and 26, "shadding" was conducted in Wahiawa Reservoir, located in central Oahu, by a team from the Honolulu Laboratory under the supervision of Fishery Biologist Tom Hida. A total of 102 buckets of threadfin shad were obtained in the 2 days and transferred to two swimming pools at the Kewalo Research Facility, where they will be acclimated to sea water and put aboard the Townsend Cromwell in mid-June for transport to the Fishery Department of Guam. The fish were carried from the reservoir to docksite in five circular transport tanks on a flatbed trailer. Excellent survival rate (initial loss <5%) was experienced for both lots of fish.

Honolulu Laboratory Scientific Staff Discusses SWFC and HL Participation in Impending Extended Jurisdiction

Fishery Biologist Dr. Robert Skillman attended a 1-week meeting at the Southwest Fisheries Center, La Jolla, held to develop a mini-feasibility study for the establishment of a fishery management information system for use by the Southwest Fisheries Center on the arrival of extended jurisdiction. At the meeting, Dr. Skillman provided estimates of data storage requirements as well as estimates of the frequency and size of input and output requests from potential users within the area of authority of the Western Pacific Council. Various parameters were developed to justify the establishment of a fishery management information system using a data base management system.

At the Honolulu Laboratory, Dr. Skillman joined Laboratory Director Richard Shomura, Dr. Jerry Wetherall, Mr. Tamio Otsu, and others in a number of discussions on the role of the Honolulu Laboratory in relation to the Western Pacific Council under extended jurisdiction. Topics at these discussions included developing a species/fisheries list, designating fisheries that currently have foreign participation, developing a plan for the preparation of background papers on these fisheries, selecting potential management units, and drafting an outline for preliminary management plans.

Feasibility of Air Scouting to Locate Tuna Schools Tested in Hawaiian Waters

On June 23, Fishery Biologist Richard Uchida was invited by the Hawaii Division of Fish and Game to participate in an air scouting mission to determine the feasibility of using airplanes to scout for tuna schools in Hawaiian waters. During the flight, which lasted about 3 hours, 11 bird flocks were sighted 15 to 20 miles north of Oahu and Molokai. One flock was definitely associated with small yellowfin tuna which were

seen jumping at the surface. The location of the bird flocks were broadcast to the boats that were fishing north Oahu. Mr. Uchida reports that airplane scouting is a feasible means of locating tuna schools and that scouting time among the vessels can be reduced and fishing time increased.

* * * * *

Also during the month Mr. Uchida, together with Messrs. Tamio Otsu and Ray Sumida, made preparations to place observers aboard four skipjack tuna pole-and-line fishing vessels in connection with the sea trials of northern anchovy as live bait of skipjack tuna fishing in Hawaiian waters.

Hawaiian Skipjack Tuna Catches Continue at
Above-Average Rate for First Half of 1976

The June 1-27, 1976 catch of skipjack tuna in the Hawaiian fishery reached an estimated 780.6 metric tons (MT), 447.4 MT above the catch for the same period in 1975 and 103.9 MT more than the June 1-27 average in 1948-75. The catch from January through June 27 was estimated at 1,871.8 MT, which is 690.9 MT above last year's catch for the same period and 127.5 MT above the long-term average.

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Not enough data were received from the NMFS observer in American Samoa for the compilation of any statistics for the months of May and June.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES PROGRAM

1976 Albacore Forecast Estimates Half of Total
Catch Will be Taken South of San Francisco

According to Dr. Michael Laurs, Leader of the Albacore Fisheries program at the La Jolla Laboratory, it appears that catches of albacore off central and southern California should improve this season over what they have been for the past several years. It is estimated that approximately 50% of the total catch will be taken in waters south of San Francisco and 50% in waters to the north. During the 1975 albacore season, about 70% of the catch was made from waters off the Pacific Northwest and 30% from waters south of San Francisco.

Dr. Laurs said that the results of preseason scouting and the apparent long-lasting and more westerly-than-usual position for this time of year of the Japanese live-bait fishery in the western Pacific indicate that at least a portion of the migration of albacore to the North American west coast will be late in arriving this season. This may be the case especially for fish entering waters off the Pacific Northwest. Good early-season fishing is expected, however, off southern California southward to about Guadalupe Island. The appearance of concentrations of fish off northern California, Oregon, and Washington is not expected until after mid-July to early August. Overall, it is expected that fishing will be good off central California, but that availability of fish there may also be somewhat later-than-usual. Fishing in the offshore waters between 135° to 145° W is expected to be fairly good about mid-June south of approximately 35° N and somewhat later north of 35° N. Because of weak oceanic frontal conditions, fish may move through the offshore waters south of 35° N rather quickly and fishing may be somewhat scattered. North of 35° N the frontal conditions appear to be stronger and fish may be more concentrated.

The outlook for sportfishing off southern California is good with an expected early start.

NMFS and American Fishermen's Research Foundation Continuing Cooperative Albacore Research Studies in 1976

The NMFS and the American Fishermen's Research Foundation (AFRF) are continuing to conduct cooperative albacore research studies in 1976. The purposes of the cooperative studies scheduled to be conducted this year are to investigate further the shoreward migration of albacore tuna into the North American west coast fishery and the associated marine environmental factors that could influence the migration, and to study the distribution and availability of albacore in offshore and nearshore regions. These studies are designed to improve knowledge of the factor affecting the onset and subsequent development of the fishery and to examine the possibilities for fishermen to extend the fishery farther offshore and to start the fishery earlier than usual.

Operations are being conducted by seven commercial fishing vessels on charter to AFRF and by the NOAA research vessel, Jordan, and will include fishery-oceanography, tagging, and fish scouting. Four jigboats on charter to AFRF are working in offshore waters during early season, and three jigboats will operate on charter during the fishing season to evaluate the availability of fish in areas other than where the main portions of the fleet are operating and conduct tagging operations.

The first pair of chartered boats (Sunrise and Lusty) left San Diego on May 22 and headed in a west-southwesterly direction to the area outside of Guadalupe Island. These boats recorded their first albacore catch of six fish on May 24 about 330 miles west-southwest of San Diego, but continued to work westward. Catches have been made daily on most 4 to 16 pound albacore.

The second pair of chartered boats (Vivian M and Sea Finn) left San Diego on June 3 and headed in a more southerly direction than the previous two chartered boats. Their first albacore catch was made on June 4 about 150 to 180 miles south-southwest and south of San Diego. Since that time, these boats have had 0 to 48 fish-days while working south to San Benitos Island and north to San Juan Seamount before heading offshore. On June 14 these boats were approximately 650 to 680 miles west-southwest of San Diego. Most of the fish caught by the two boats have been 7 to 24 pounds and the best catches and fish signs observed were between Cape Colnett and San Martin Island.

The Jordan began its cruise on June 2, heading westward to 20°N, 137°W. On June 7, the Jordan began oceanographic work in cooperation with the two chartered jigboats in the vicinity. The Jordan also trolled for albacore on June 8-13 between 32° to 34°N and 137° to 139° 15'W but caught only a few fish (see following article).

At month's end, mostly scratch fishing was reported from west of San Diego to Guadalupe Island by albacore jigboats. Most of the catches have been between 15 to 30 fish per day with some catches greater than 100 fish per day. Albacore being landed from this area are averaging about 10 to 13 pounds. Sportboats out of San Diego are also fishing off northern Baja California and have had numerous days when catches were 1 to 3 fish per passenger. Many of the sportboat catches have been on 16 to 18 pound albacore. Albacore are also beginning to show off central California; one boat reported a small catch near Davidson Seamount on June 29.

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A price settlement of albacore landed on the U.S. West Coast was reached on June 3; this price is \$910 per ton delivered to the canneries.

Jordan Completes 32-Day Albacore-Oceanography Cruise in Cooperation with AFRF

The NOAA research vessel, Jordan, completed a 32-day albacore-oceanography cruise in cooperation with the American Fishermen's Research Foundation (AFRF) this month. The objectives of the Jordan cruise were to improve understanding of the physical processes involved in the frontal boundaries of the Transition Zone in the eastern North Pacific, and through this understanding provide a basis for relating these processes to the

distribution and relative abundance of albacore during the early-season onshore migration; examine the feasibility of using satellite observations to monitor the changes in ocean characteristics that influence the spatial and temporal distribution and relative abundance of albacore tuna.

Oceanographer Ron Lynn was Chief Scientist and Dr. M. Stevenson of the Inter-American Tropical Tuna Commission was Visiting Scientist, together with six of his colleagues.

The AFRF chartered four commercial fishing vessels to conduct early-season scouting for albacore in the offshore region that has been productive in recent years (approximately 1,000 nautical miles west of Pt. Conception). NMFS provided scientific observers aboard two of these vessels. The Jordan trolled for albacore on a time-available basis for a total of 1,188 line-hours and caught 125 albacore. Samples for analysis of blood, muscle tissue, stomach contents, and fat were taken. Daily radio contact was maintained with the charter vessels for exchange of catch and oceanographic data.

Primary activities on the Jordan centered on the oceanographic studies of the subtropic and subarctic fronts, which were examined in detail. Multiple crossings of each front were made during a broad-scale oceanographic survey. After determining the location and orientation of each, 90-mile transects were made. STD stations were spaced at 5 and 10 miles. At some stations water samples were collected for analysis aboard ship of dissolved oxygen and chlorophyll and nutrient samples were frozen for analysis ashore.

Horizontal gradients in salinity on the order of 0.3 and 0.4 ppt in 5 nautical miles were found at the subtropic and subarctic front, respectively. These gradients extend to depths exceeding 140 m. A core of extra high salinity water was found adjacent to the saline side of the front which may indicate an eastward jet-like flow. Preliminary estimates of geostrophic velocity show that most of the advection is centered about these fronts. A 25-hour time series of hourly STD's at the subtropic front showed considerable short period variations in thermal structure between 400 and 700 m. These variations diminished away from the front.

While the oceanographic survey was highly successful, the satellite "ground truth" efforts were somewhat limited by clouds. There was an anomalous shift of the mean position of the meteorological high pressure cell to the north of 40° N. Hence, fewer cloud-free days were experienced than expected. Fortunately, during experiments for overpasses of LANDSAT, Jordan was maneuvered to cloud-free areas. This was aided by onboard reception of APT satellite scans and weather facsimile charts copied from Navy Fleet Numerical Weather Central, Honolulu. Arrangements were made prior to the cruise for satellite remote-sensed data to be preserved.

The AFRF albacore scouting was less successful than anticipated. Albacore were caught in the Transition Zone and within proximity to the major ocean fronts but no large and persistent concentrations were found as had been the case in previous years. Overall catch rates were low to moderate.

The low fishing catches appear to be related to the late arrival of fish. Information received from Japan indicates that the Japanese bait-boat fishery began several weeks later than usual and is located much farther west than is usual for this time of year.

STOCK AND RECRUITMENT PROGRAM

Cannibalism Studied as Source of Early Mortality in the Anchovy

Dr. John Hunter, Fishery Biologist, and his assistant Ms. Carol Sanchez report that work continued on examination of the stomach contents of adult anchovy captured this spring in areas of anchovy spawning. The objective of this study is to determine the incidence of cannibalism and to determine the importance of cannibalism as a source of egg and larval mortality in the anchovy. Not all samples have been examined, but preliminary examination of the data indicate that the incidence of adults feeding on their own eggs ranged from 0 to 8% of the fish captured at night in a trawl sample. The number of eggs found in the stomach ranged from a single well-digested fragment of a chorion to over 700 eggs in good condition and obviously recently ingested. No larvae were found in any stomachs examined so far, but this was not surprising because laboratory work has indicated that digestion of the smaller larvae proceeds very rapidly (less than 2 hours) whereas eggs and especially the chorions may persist in stomachs from 6 to 8 hours. Recently ingested eggs could be staged and this work indicated that the fish had fed on the previous night's spawn rather than on those eggs released on the night they were captured. This is of interest because ingestion of eggs at the time of spawning is more likely to be a density independent mortality whereas ingestion of the previous night's spawn is more likely to be density dependent mortality.

Efforts Continue to Assess Effects of Starvation on Jack Mackerel Larvae

Ms. G. Theilacker, Fishery Biologist at the La Jolla Laboratory, is continuing to assess the effects of starvation on jack mackerel larvae. This month, jack mackerel eggs were collected 40 miles west of San Clemente Island and returned to the aquarium at the Southwest Fisheries Center where the larvae were reared.

In the initial rearing experiments with jack mackerel larvae, efforts were concentrated on determining the histological changes caused by starvation. The larvae were examined individually and differences in various tissues between feeding and starving fish were noted. There were 19 histological criteria chosen which were indicative of starvation. All of these were evident in larvae which had starved for 3 days or more; however, only 2, and sometimes 3, of the characteristics were recognized

in larvae starved less than 3 days. These larvae were histologically graded as "intermediate", between feeding larvae scored as "healthy", and emaciated or "starving" larvae.

Experiments were designed in May to determine 1) whether the "intermediate" grade larva was capable of initiating feeding, and 2) the effect of starvation on development. With the help of Jack Metoyer, Biological Technician, the first experimental group of larvae was reared in a series of 10-liter containers. They were either fed, starved, or deprived of food for 1 to 4 days before feeding. Larvae were found to be capable of feeding when feeding was delayed for 1 or 2 days. These fish were allowed to feed for 2 more days before sampling for histological examination.

In a second experiment, jack mackerel were reared in 100-liter containers to determine the effect of starvation on body form. If it can be demonstrated that starvation in larvae is evident from differing body proportions, it will be less time consuming to use morphometrics instead of histology as a tool to assess starvation in the sea. Larvae were sampled daily from a fed and a starved treatment.

To date, 285 larvae have been sampled and measured from the two rearing experiments. The dimensions which were taken for each larva were: standard length, head length, body depth (at pectoral and anus), and eye diameter. All these larvae will be submitted to a histological study.

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Mr. David Kramer, Fishery Biologist, in recent experiments on shrinkage of larvae preserved in an alcohol-glycerin mix for special studies on otoliths found that the amount of shrinkage of anchovy larvae decreased with increased larval length. This was attributed to increase in muscular structure with some degree of vertebral ossification. For some time now, it has been assumed that there was a shrinkage of about 10% in larvae collected in the field and preserved in formalin. However, with the results noted above, it was decided to conduct an experiment on shrinkage with size on larvae reared in the laboratory and preserved in formalin. Results thus far show that larvae 4 to 11 mm long shrink an average of only 3%. This has been attributed to the fact that the larvae were preserved immediately after being measured alive and that their musculature had not deteriorated.

These results seem to indicate that the 10% shrinkage factor traditionally used is not the result of formalin preservation per se but rather is the result of shrinkage occurring after death in the plankton net. Tests will be run to confirm this conclusion.

Data from Microdistribution Cruises Will Aid in Description of Larval Environment

Dr. R. Owen, Oceanographer, and Mr. Vic Chow analyzed and processed data from the March microdistribution cruises designed to elucidate the environment on scales significant to fish larvae. Current meter records from 20 and 40 m depth at the Cardiff station were computer processed to yield 1) N-S and E-W components of flow for every half-hour of the 11 days of recording, 2) plots of these components vs. time, 3) Fourier-fitted tidal contribution to the flow, and 4) plots of particle trajectories. Comparison of the particle trajectories with the observed trajectory of the drogue at 17 m depth appear to agree, given the complex coastline and bathymetry encountered by the drogue, but not by the stationary current meters.

Counts of phytoplankton and microzooplankton from sets of 10 samples, each taken 20 cm apart during the March cruises, were initiated. From the three samples so far enumerated, microzooplankton components such as ciliates and copepod nauplii appear to be well-sampled and to vary systematically over these very small intervals, although further counting is needed to confirm this.

Plots were made of vertical and horizontal microdistribution of chlorophyll a, phaeo pigments, nutrients and particle counts from the mixed layer and pycnocline during the March cruises. Plots also were completed for Jordan's pump profile time and space series showing depth and intensity of the chlorophyll maxima while following the drogue and while maintaining position near the current meters at the 100 fm depth off Cardiff.

ECOLOGY OF THE CALIFORNIA CURRENT

Dr. Elbert H. Ahlstrom, Senior Scientist, reports that his staff in the Marine Environmental Assessment program, have been involved in the following activities during May and June 1976. Three technicians are working on identification of CalCOFI samples:

Elizabeth Stevens is working on extended CalCOFI Cruise 7210, identifying fish taken both in Neuston net hauls and regular oblique net hauls. The total collections from both nets total about 400 samples, of which about 250 have been identified, enumerated, and tabulated. Ms. Elaine Sandknop reports that only 12 samples remain to be identified on CalCOFI Cruise 6912. Miss D'Vincent is working up identification of fish larvae samples taken on CalCOFI Cruise 7201.

Biologist John Butler is identifying fish taken on trawl collections made earlier this year during the porpoise boundary cruise to the eastern tropical Pacific. Various interesting specimens were taken on this cruise including the first eastern Pacific record of Lestidium bigelowi, a paralepidid with interesting ventral photophores.

Work also continued on assembling series of flatfish larvae. Biologist Barbara Sumida has completed a series of illustrations of the pleuronectid flatfish, Pleuronichthys ritteri. Dr. Ahlstrom also spent considerable time working on flatfish larvae.

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Dr. Ahlstrom further reports continued activities on the preparation of manuscripts. Galley page proofs were received of the manuscript "Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions and early life histories and observations on five of these from the northwest Atlantic" by E. H. Ahlstrom, J. L. Butler, and Barbara Y. Sumida. This paper is scheduled to be published in the July issue of the Bulletin of Marine Science, vol. 26, no. 3, pp. 285-400. Dr. Ahlstrom said that he was pleased with the size and quality of the reproduction of illustrations of eggs, larvae, and juveniles of the 19 species covered in the sizable contribution.

Responding to the comments of reviewers, various editorial changes were made in the manuscript, "Guide to the identification of scorpionfish larvae (family Scorpaenidae) in the eastern Pacific with comparative notes on species of Sebastes and Helicolenus from other oceans" by H. G. Moser, E. H. Ahlstrom, and E. M. Sandknop. The manuscript has been returned to Dr. Bruce Collette, Scientific Editor for NMFS publications, for probable publication in the NOAA Circular series.

A version of the talk which Dr. Ahlstrom has been invited to present at a plenary session of the Second European Ichthyological Congress in Paris in September 1976, was completed and submitted to the Chairman of the Congress. The paper is titled, "Eggs and larvae of fishes and their role in systematic investigations and in fisheries" by Drs. Ahlstrom and Moser.

Data on distribution and relative abundance of rockfish larvae, Sebastes spp. for 155 CalCOFI cruises made between 1951-69 has been assembled for a CalCOFI Distributional Atlas of Fish Larvae in the California Current. A number of the Sebastes records from the southern part of the range have been checked for accuracy. This Atlas will be co-authored by Drs. Moser and Ahlstrom, and Ms. Sandknop.

Center Scientists Attend Instituto Nacional de Pesca CalCOFI Meeting in Taxco, Mexico

Representing federal participation in CalCOFI, Dr. Reuben Lasker, Leader of the Coastal Fisheries Resources Division, at the La Jolla Laboratory, accompanied by Dr. Paul Smith, Fishery Biologist, attended an INP/CalCOFI meeting in Taxco, Mexico, June 24-25. Among the agenda items discussed were 1) sportfish statistics and possible publication, 2) implementation of acoustic surveys, 3) CalCOFI joint cruises, and 4) a joint data management system and standardization of equipment for CalCOFI cruises such as the Bongo net, Isaac-Kidd midwater trawl, manta net, etc.

According to Dr. Lasker, the cooperative work being done on acoustics between CalCOFI (Smith of NMFS and Mais of CF&G) and INP has gone very well. Trawling calibration will be an essential part of acoustic sampling and the research vessels Alaska (CF&G), Humboldt (INP), and Jordan (NOAA/NMFS) will participate in joint testing of trawls during the sportfish-anchovy interaction cruise scheduled for the summer of 1976. An acoustic Subcommittee Manual on procedures is nearing completion. Mr. John Radovich of CF&G pointed out that egg and larva surveys should continue to be used as a standard for all other assessment techniques.

Data collection and processing of egg and larva data was well in hand by both INP and CalCOFI with much credit due to Dr. Smith for this while he was a consultant to FAO in Mexico.

Great interest was focused on the California Department of Fish and Game management plan and revised anchovy population estimates. Mr. Radovich presented the MacCall-Stauffer equilibrium curve which gives 450,000 tons per year as the estimated maximum sustainable yield of anchovy.

Research Results Offer New Insights into Larval Survival

Dr. William Vlymen completed his tenure as a NAS/NOAA Post-Doctoral Research Fellow at the La Jolla Laboratory this month with completion of a manuscript entitled, "A mathematical model of the relationship between larval anchovy (E. mordax) growth, prey microdistribution and larval behavior." In this paper, Dr. Vlymen points out quantitatively the extreme importance of prey microdistribution and its interrelationship with larval behavior in modulating the growth rate of the larval anchovy. The work is the first and most complete such model for any larval species and is a further justification for improving, understanding, and ability to sample on extremely small scales if fluctuations in larval survival are to be completely understood. The paper appears to point the way for the development of alternate larval survival predictors via the interaction of weather with prey microstructure. The methods and results of the research also offer new explanations for the discrepancy between laboratory food requirements and the availability of similar food types in the ocean.

Oceanic Fisheries Resource Division

JNA RESOURCES PROGRAM

Tuna Fishery Management Model Nears Completion

The stochastic fishery management model being developed by Dr. Dan Huppert, Economist at the La Jolla Laboratory, is nearing completion. The required computer programs are operational, and various hypothetical management schemes have been examined. Results of the preliminary studies indicate that small random fluctuations ($\pm 20\%$) in the catchability of tuna will cause greater losses in the value of a management program than will random fluctuations ($\pm 20\%$) in the surplus yield of the stock.

An effort will be made to develop a realistic version of the model to represent the Inter-American Tropical Tuna Commission management program for yellowfin tuna; then an estimate of the potential reduction in variance of the error in catchability will be made. This estimate will be based upon current monitoring activities of the Real-Time Fisheries System program at the La Jolla Laboratory and the reduction in variance of catch per effort achieved through use of the environmental index developed by the staff of the program. The value of the potential reduction of the error in the perceived catchability can then be estimated.

Input from Participating Fishermen Sought to Improve Facsimile (FAX) Products

FAX products, such as weather and oceanographic charts, are broadcast to the U.S. tropical tuna fleet by the Department of Commerce-licensed radio station WWD on approximately a daily basis. In exchange for this service, participating boats collect and transmit environmental data to WWD for use by scientists at the La Jolla Laboratory. Coordination of this activity is handled by Oceanographer Dick Evans of the La Jolla Laboratory.

Mr. Evans reports that comments on the FAX products are regularly solicited from participating fishermen and every effort is made to improve the products. Recently, Mr. Evans held discussions with Messrs. Emil Gunther and Claire Jensen of the National Weather Service (NWS) to relay comments he received from fishermen and to explore procedures for improving the weather charts. One outcome of the meeting is a modification in the routing procedure for weather data received from certain ships by WWD so that the data could be available for use in weather charts on a more timely basis.

Tuna Vessels Continue Participation in FAX Program

During June, 22 U.S. tuna seiners participated in the FAX program of the La Jolla Laboratory. Reporting rates this month were down from June 1975 by 32%, as shown below:

Reporting Rates

	<u>Weather observations</u>	<u>XBT observations</u>	<u>Total</u>	<u>Year-to-Date</u>
1975	222	63	285	1,554
1976	182	11	193	1,961
Percent change	-18.0%	-82.5%	-32.3%	-20.8%

Congratulations again to Messrs. Noah and John Gomes of the fishing vessel, Santa Rosa, who led cooperating vessels by radioing 29 weather observations to the Southwest Fisheries Center in June.

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Communications specialist Mark Sweeney of the La Jolla Laboratory completed installation of a FAX system aboard the research vessel, Prospector, and renovation of a FAX system from the seiner, Bette M, which recently sank. Currently, a total of 59 FAX units belonging to the La Jolla Laboratory are aboard U.S. tuna vessels that fish in the eastern tropical Pacific.

Final 1975 Atlantic Tuna Statistics Sent to ICCAT

Yellowfin tuna was the dominant species in the American catch accounting for approximately 60% of the total Atlantic tuna catch. Skipjack tuna contributed about 32% of the total. Virtually all of the catch of these species was made in the eastern Atlantic, off Africa. Catches by regions of the Atlantic and species are shown

1975 American purse seine catch of tunas from the Atlantic Ocean
(Prepared by the National Marine Fisheries Service,
Southwest Fisheries Center, La Jolla,
CA 92037, June 15, 1976).

Ocean Region	Total Catch (metric tons) by species								Total	Number of Vessels
	Yellowfin ¹	Skipjack ¹	Bigeye	Little Tunny	Auxis	Bluefin	Albacore	Other		
Eastern Atl.	13,960	7,369	67	64			1	18	21,479	32
North-Western Atl.	139	149		1		1,986			2,275	9
Mid-Western Atl.	229	33							262	14
Gulf of Mexico	7	14							21	
South-Western Atl.										
Total	14,335	7,565	67	65		1,986	1	18	24,037	

¹Include catches by Dutch (Netherlands Antilles) tuna seiners.

Catch and effort statistics from logbooks were compiled by 1° and 5° areas of the Atlantic Ocean. The results showed that approximately 91% of the total yellowfin tuna catch and 55% of the total skipjack tuna catch was made in the Gulf of Guinea. September and October were the months of greatest catches for both yellowfin and skipjack tunas.

Length frequency samples were used to estimate the length frequency distributions of yellowfin, skipjack, bigeye and little tunny in the American catch. Results showed that approximately 0.9 million yellowfin tuna and 3.2 million skipjack tuna were caught by American seiners fishing in the eastern tropical Atlantic.

Age I fish (31-85 cm) dominated (63%) the yellowfin tuna catches and older fish (100-183 cm) were present in greater numbers than in 1974. The dominant age group was one-year olds (31-51 cm) and it accounted for approximately 16% of the skipjack tuna catch.

Sampling Continues of Foreign-Caught Atlantic Tunas in Puerto Rico

Foreign-caught Atlantic tunas that are landed in Puerto Rico are being sampled by Biological Technician Eugene Holzapfel of the La Jolla Laboratory. Mr. Holzapfel has been stationed in Mayaguez, Puerto Rico, since March 1975. So far this year he has measured 1,516 tunas for length from a sampled tonnage of 1,741 metric tons. The number of fish measured by species is as follows:

<u>Species</u>	<u>Tonnage sampled (metric tons)</u>	<u>Number of fish measured</u>
Albacore	850	100
Bigeye	55	56
Skipjack	766	451
Yellowfin	70	909
Total	1,741	1,561

All bigeye tuna landed in Puerto Rico are labeled as yellowfin tuna and included in tonnages of yellowfin tuna. One of Mr. Holzapfel's assignments is to collect data for use in estimating the proportion of bigeye tuna in the landings labeled as yellowfin tuna. Data are collected by sampling the landings for species composition with species determined from external characters, such as color pattern, shape of body, and length of pectoral fins. This technique has been proven to be reliable in separating bigeye tuna from yellowfin in freshly-caught fish, but there is doubt it is reliable with the frozen or partly frozen fish that are sampled in Puerto Rico. To test the reliability of the technique, an experiment is currently being conducted in which species are determined from 1) external characters, and 2) examination of the liver. Examination of the liver is recognized as the most accurate method in identifying bigeye tuna from yellowfin tuna. To date, 325 fish have been sampled and about 1% misidentified from external characters.

Preparations Underway for Upcoming ICCAT Meeting

Staff members of the Tuna Resources program, which is headed by Dr. Gary Sakagawa of the La Jolla Laboratory, have begun final preparations for the upcoming annual meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) which will be held November 10-23, 1976, in Madrid, Spain. Approximately 18 research tasks, including stock assessments of Atlantic yellowfin, skipjack, and bigeye tunas, which were assigned to the La Jolla Laboratory by the Commission's Standing Committee on Research and Statistics, are underway and documents describing the research results are being prepared. Plans call for all documents to be completed by October 15.

Tabulation of 1975 Tuna Fishery Statistics for American Tuna Seiners Fishing in Atlantic Completed

Mathematician Al Coan and Mathematics Technician Ed Ciarniello of the La Jolla Laboratory completed final tabulation of tuna fishing statistics for American tuna seiners that fished in the Atlantic Ocean in 1975. The statistics were obtained from landing records, logbooks, and samples of fish measured at the ports of landing. Biological Technician Eugene Holzapfel of the La Jolla Laboratory and staff members of the Inter-American Tropical Tuna Commission, through contract, assisted in collection of the data. The statistics were recently submitted to the International Commission for the Conservation of Atlantic Tunas for distribution to scientists involved in assessing the state of the Atlantic tuna stocks.

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Dr. G. Sakagawa, Leader of the Tuna Resources program at the La Jolla Laboratory, reports that a contract has recently been concluded with the University of British Columbia to develop a mathematical model relating schooling strategy of tunas, fishing effort of purse seiners and fishing mortality, and to test the model with data from the tropical tuna fisheries. Dr. Colin Clark of the University of British Columbia, Department of Mathematics, Vancouver, B.C., will be the principal investigator. In addition to a description of the model, Dr. Clark will also identify and specify the procedures to obtain information that is currently inadequate or lacking for a better definition of the model and for the understanding the behavior of the fishery system.

TUNA/PORPOISE PROGRAM

NMFS Announces Porpoise Quota

NMFS has announced a sharp reduction in the number of porpoises that U.S. fishermen may take this year incidental to fishing for yellowfin tuna. Effective immediately, a limit of 78,000 porpoises will be in effect. When the limit is reached, U.S. fishermen will be prohibited from purse seine fishing for yellowfin tuna in association with porpoises for the remainder of the year.

According to Mr. John Everett, Manager of the Porpoise program, during the first 3-1/2 months of 1976, about 24,000 porpoises were taken by U.S. fishermen. This is a sharp reduction from the 74,000 taken during the same period in 1975, a year in which a total of 134,000 porpoises were killed. The 78,000 quota is not expected to be reached before the end of the year.

This action is in keeping with provisions of the Marine Mammal Protection Act of 1972 and a stay of a District Court Order by the Circuit Court of Appeals for the District of Columbia. On May 11, Judge Charles R. Richey ruled that present NMFS regulations pertaining to the taking of porpoises incidental to yellowfin fishing operations were void because they were contrary to law. Judge Richey noted that among other things, NMFS had not determined the optimum sustainable population of each species of porpoise, the effect the proposed taking of porpoises would have upon the stocks, and if this effect would adversely affect the stocks. In addition, Judge Richey said that the regulations did not establish the number of animals that could be killed as a condition of the general permit tuna fishermen must have in order to take porpoises while fishing for yellowfin tuna.

Judge Richey also ordered that no yellowfin tuna purse seine fishing be permitted in association with marine mammals after May 31 until the optimum sustainable population had been established and the effect the taking would have on the populations determined.

On June 1, a stay of Judge Richey's order, pending an appeal by NMFS, was granted by the Circuit Court.

As a result of the stay, NMFS in the person of Mr. Gerald Howard, Regional Director, Southwest Region, Terminal Island is initiating efforts to place an additional 10 porpoise observers aboard tuna purse seine vessels. Also continuing is the ongoing cooperative gear testing program on commercial vessels which is a principal responsibility of the Porpoise/Tuna program at the La Jolla Laboratory.

A notice establishing the limit appeared in the Federal Register of June 11.

Future of NMFS Gear Observers in Doubt Following Judge Richey's Decision

At the time of Judge Richey's order to stop yellowfin tuna purse seine fishing in association with porpoise, the NMFS and the tuna industry-sponsored Porpoise Rescue Foundation had launched a cooperative study of fishing gear and techniques designed to reduce porpoise mortality in the eastern tropical Pacific yellowfin tuna fishery. Thus, by mid-May, six tuna purse seiners equipped with the Bold Contender system, which includes a double depth 1-1/4 inch mesh Medina panel, porpoise apron, and chute in the backdown area of the net, and six purse seiners with only a double depth 1-1/4 inch Medina panel were at sea carrying NMFS gear technicians. Due to uncertainties following Judge Richey's decision six of these technicians' trips were aborted. Then on June 4, 1976, certificate holders were advised that NMFS observers and gear technicians were to continue activities in accordance with prior plans aboard their vessels until further notice.

At month's end, five had landed with complete data and six had aborted trips. Using the data from all trips, the Bold Contender systems had achieved a kill rate of 3.4 per set and the double-depth Medina panel had achieved a rate of 16.0 per set. The fleet average presently is 11.8 per set for 1976.

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A meeting on June 30 sponsored by the Porpoise Rescue Foundation was held in San Diego to bring together various industry, government and environmental representatives to discuss present and future porpoise/tuna research. Attending from the Center were Bill Fox, John Everett and Dick McNeely.

Plans Made for Aerial Survey of Porpoises in Eastern Tropical Pacific

Dr. Eric Barham and the staff of the Porpoise/Tuna Interaction program at the La Jolla Laboratory, assisted by Mr. Frank Wittman, Engineer, and Joe Benigno, Fishery Biologist, of the NMFS Southeast Fisheries Center in Miami, Florida and Mr. Hap Caldwell, Photographer of General Electric, are in the first phase of a study designed to test and evaluate aerial survey methods and techniques. These preliminary studies took place in mid-May off the coast of southern California and are designed at optimizing film-type, camera settings and viewing periods. This preliminary study is part of a larger plan for developing a means for a necessary assessment of porpoise stocks that is independent of the tuna fishery data.

On June 11, representatives of the Marine Mammal Commission and the NMFS Fisheries Engineering Laboratory at Bay St. Louis, Mississippi, met with Dr. Barham and Mr. John Everett, Manager of the Porpoise/Tuna program, to discuss results of the local aerial film test and plans for the mid-June aerial survey procedures development and school size estimation study over the fishing grounds off Mexico.

Funding for the follow-on aerial porpoise survey was included in the President's 1977 budget submission to Congress.

Negotiations are being completed with a Mexican firm to provide aircraft for the porpoise school size estimation survey scheduled to begin about June 25 for 12 to 14 days. During the survey, spotter and spinner schools will be photographed using the 9-inch format camera, and results will be compared with observer estimates. The flights are presently awaiting clearance from the Mexican Government.

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In other activities of the Porpoise/Tuna Interaction program at the La Jolla Laboratory, a meeting was held at the Southwest Fisheries Center on May 7 to discuss planning for the cooperative U. S. Marine Mammal Commission/NMFS/Porpoise Rescue Foundation (a group funded by the U.S. tuna industry), porpoise behavior charter cruise scheduled for October-November 1976. The primary purpose of this cruise will be to study porpoise behavior from the time of sighting through subsequent capture and release from a tuna purse seine. Attendees included Chris Norgaard of Del Monte, Frank Alverson of LMR, Inc., Robert Hofman of the Marine Mammal Commission, Bill Evans of the Naval Undersea Center, Ken Norris of the University of California, Santa Cruz, Warren Stuntz of the University of Wisconsin and William Fox, John Everett, William Perrin and David Holts of the La Jolla Laboratory.

In this connection Dr. Stuntz has reported on duty to the La Jolla Laboratory to coordinate porpoise behavior research. Dr. Stuntz is working with Dr. Norris on a contract from the U.S. Marine Mammal Commission.

Efforts Underway to Convene Workshop to Define Optimum Sustainable Population of Porpoise

Dr. William Fox, Chief of the Oceanic Fisheries Resources Division at the La Jolla Laboratory, is spearheading an effort to convene a workshop aimed at defining "optimum sustainable population" (OSP) and developing estimates of current populations of porpoise involved in the tuna fishery, their OSP levels, and the impact of fishing mortalities on these population levels.

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Correction: Page 17 of the April SWFC Monthly Report, paragraph 1, line 4 should read--..."the staff of the Tuna/Porpoise Program at La Jolla determined that a greater-than-67% reduction in the porpoise kill occurred in the first part of 1976."

TIBURON LABORATORY

COASTAL FISH COMMUNITIES INVESTIGATIONS

Distribution of Planktivorous Fishes in Lagoon at Eniwetok Related to Distribution of Open-Water Plankton

In a study of feeding relations among planktivorous fishes at Eniwetok Atoll, Marshall Islands, Dr. Hobson and Fishery Biologist Tony Chess have determined that distributions of planktivorous fishes relate to distributions of open-water zooplankters, including certain copepods and

larvaceans. These zooplankters are numerous where oceanic water circulates into the lagoon, and here are the greatest numbers of certain planktivorous fishes adapted to feed on them. These planktivores include the damselfishes Chromis agilis, C. analis, C. margaritifer, C. lepidolepis, C. ternatensis and Dascyllus reticulatus; the sea bass Microlabrichthys pascalus; and the snapper Caesio tile. In contrast, where circulation of oceanic water is limited the open-water zooplankters are correspondingly limited--sometimes rare or absent. Here the above fishes tend to be replaced by other planktivorous species, for example the damselfishes Pomacentrus pavo and P. vaiuli, that are adapted to feed on drifting algal fragments and other debris.

Rockfish Growth and Mortality Rates Correlated with Morphological Characters

Dr. William Lenarz, Leader of the Rockfish Analysis Group, reported that in general, the biology of the more than 50 species of rockfish that inhabit California waters is poorly known. Little other than basic morphological descriptions, geographical distributions, and record sizes have been published for the majority of species. Results of Dr. Hobson's studies suggested to Dr. Lenarz that growth and mortality rates of rockfish would be correlated with morphological characters.

Hobson's work showed that fishes with relatively strongly incise caudal fins tend to be farther away from protection of reefs than fish with truncate or rounded fins. Lenarz developed the hypothesis that rockfish with strongly incised caudal fins would have relatively short fin spines and relatively high growth and mortality rates. He based his hypothesis on the observation that fin spines and rays are often used for territorial display and that fish found near protection would tend to be more territorial than fish found away from protection. Lenarz also recalled studies that revealed that territorial birds tend to live longer than birds without territories. Thus he hypothesized that rockfish with deeply incised caudals would have relatively low values of $1/k$ (k is the growth rate coefficient of the Bertalanffy growth curve and $1/k$ has been shown by others to be related to longevity).

Lenarz first divided rockfish into groups of four tail types. The results were as expected. Relative spine lengths were inversely related to the degree that caudals were incised (although there was considerable variation within groups). Reasonably accurate estimates of k have only been estimated for 12 California rockfish that occur in only two of the groups. As expected, estimates of $1/k$ were lower for rockfish with deeply indented caudals than for rockfish with moderately indented caudals. Again there was considerable variation within groups.

It is of interest to note that the most important commercial species such as bocaccio, chilipepper, and Pacific Ocean perch fall into the group with deeply incised caudals. The shortbelly rockfish, which is too small to be an important food fish, but apparently very abundant, also falls in this group. On the other hand, many of the rockfish species that inhabit near-shore areas and thus available to sportfisheries, such as kelp, copper, and grass rockfish, have nearly truncate vertical or rounded caudals. These species would be expected to be relatively slow-growing, long-lived species that are relatively vulnerable to overfishing.

Lenarz next developed a linear model to estimate $1/k$ for the poorly known species. He used standardized lengths of the longest dorsal spine and record size as independent variables. Both variables are significant at the 95% level and r^2 is 0.54.

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Mr. Peter Adams, Operations Research Analyst, started a manuscript on the consequences of life history characteristics. A theoretical analysis of the subject suggests that under varying degrees of density-independent and density-dependent mortality, these characteristics should vary in a correlated fashion. A second group of characteristics; growth rates, mortality rates, and egg production at a unit size should also vary in a positive fashion, but the two groups should vary inversely to each other. Test of these predictions from data gathered from the literature supports these conclusions. The analysis suggests general management strategies for fishes in early stages of development when specific data on the fishery is still relatively poor.

PHYSIOLOGY INVESTIGATIONS

Sources of Early Mortality Studied in Striped Bass

Dr. Jeannette Struhsaker, Chief, Physiology Investigations, reported that during May, striped bass eggs were obtained with the cooperation of the California Department of Fish and Game at the Elk Grove hatchery near the Sacramento River. Two groups of eggs were obtained and two experiments were conducted testing the effects of different food regimes on larval development, growth and survival. Several hundred larvae survived at the end of the first feeding experiment. These larvae are now 50 days old and are being maintained in the laboratory to follow later development and potential delayed mortality. A second experiment is underway contrasting development and survival in fresh water vs. isosmotic salinity (3.0 to 8.0 to 10.5 ppt in the first 10 days) treatments. Larvae have poorer survival in fresh water which appears to relate to differences in ionic composition of the water between the two treatments. Chemical analyses are being performed on water samples from these treatments. Mean survival in the

isosmotic treatment is approximately 80% to date (larval day 22). The testing of different food regimes (at optimal densities) is also being continued. Cyclopoid copepods which are fed on by larvae at a later stage (about 17 days +) were tested on younger striped bass larvae. At earlier stages, the copepods feed on the fish larvae, resulting in 100% mortality. Preliminary experiments are being run to determine the predatory behavior of these cyclopoids in relation to other zooplankton and to different ages/sizes of striped bass larvae.

BLM Oil Project: Food Chain Studies

Mr. Thomas Yocom, Fishery Biologist, has arrived at the Tiburon Laboratory and will be assuming major responsibilities for the research under the BLM oil contract. Specimens are being obtained, equipment ordered, and personnel hiring are underway.

Green Pigment Studied in Unfertilized Ovarian Striped Bass Eggs

The green pigment in unfertilized ovarian eggs is being identified and studied by Dr. Struhsaker and Dr. Welton Lee from the California Academy of Sciences. The "greenness" of eggs appears to relate to hatching success and subsequent larval survival. The green pigment is probably a carotenoprotein complex. At fertilization a change in pigment from green to yellow (primarily in the yolk sac) occurs. Subsequent pigment development includes elaboration of melanophores and chromatophores which appear to contain yellow, orange and red carotenoid pigments. Development of pigmentation also varies between different food regimes, both in amount and in color. It is hoped to determine the functional significance of pigments at various developmental stages, particularly their significance in metabolism and survival.

COASTAL FISHERIES INVESTIGATIONS

Euphausids Distributed to Potential Buyers for Evaluation

Mr. Susumu Kato, Leader, Coastal Fisheries Investigations, reported that several pounds of Euphausia pacifica collected by Ray Allee of the California Department of Fish and Game aboard R/V Alaska were taken for processing to a freeze-drying plant in south San Francisco. The euphausids will be prepared in several freeze-dried forms and distributed to potential buyers for evaluation. Presently, euphausids are being used primarily as an aquarium fish food, particularly for the fast-growing tropical marine fish trade. A small fishery for euphausids now exists in British Columbia, and we are investigating the feasibility of developing a similar fishery in the Monterey area.

Preparations for Cruise on David Starr Jordan Continue

Preparations for the September cruise of R/V David Starr Jordan are continuing. Most of the necessary materials for building experimental gear have been purchased, and Project Leader Susumu Kato and two volunteer students are now building trap and line gear. The objectives of the cruise are to explore deep-water trawling grounds between Morro Bay and Santa Barbara, and to investigate the feasibility of using alternate methods to catch spot prawn and rockfish. At least 20 fishermen and about 10 researchers from south-central California have indicated their desire to accompany parts of the cruise.

Recreational Fisheries Improvement Task - Preparations for Summer-Fall Rearing of Salmon Continue

Preparations for summer-fall rearing of coho salmon continued this month with continuing maintenance and repair of floating pens and nets by Laboratory staff and members of the San Francisco Tye Club. The young fish, being reared at the California Department of Fish and Game's Mad River hatchery, averaged 90 to the pound at month's end. Their projected growth to 30/lb ("smolt" or saltwater adaptable size) should occur near the end of July or the first part of August, at which time they will be shipped to Tiburon. The over 40,000 fish were transferred to UV treated water at the hatchery to avoid disease problems that have occurred there in the past.

Plans were made to travel to Mad River to inoculate these fish against vibrio, the most common coho salmon saltwater disease, the week of July 19. The planned-for inoculating crew would consist of four from the Tiburon Laboratory, four to five Tye Club members and four from Sea Grant. After inoculation, the fish must remain in fresh water for at least 10 days to build up antibodies against the vibrio serum before being transferred to saltwater.

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Angler's Guide to the U.S. Pacific Coast: Guide Reviewed by Authors and Office of Scientific Publications Staff

During the week of June 21, discussions on the Pacific Angler's Guide were held in Seattle, NWFC, between representatives of NMFS' Scientific Publications Staff and authors Jim Squire, Fishery Biologist at the La Jolla Laboratory, and Susan Smith, Publications Specialist at the Tiburon Laboratory. The purpose of the trip was to deliver the camera-ready artwork and chart mechanicals to SPS, to discuss final changes in the galley proofs before returning them to the printer, and to make certain decisions on the page layout, including color specifications and design.

It is expected that the Guide will be available for distribution in the early fall.

PUBLIC RELATIONS - SOUTHWEST FISHERIES CENTER

NMFS Represented at Fifth Annual Fishermen's Festival

A NMFS exhibit, prepared by Mr. Ken Raymond, Scientific Illustrator at the La Jolla Laboratory, was a crowd pleaser at the Fifth Annual Fishermen's Festival, held in Santa Barbara on May 29. The event attracted more than 5,000 visitors to the breakwater for the traditional blessing of the commercial fishing fleet. The list of distinguished guests at the festival was headed by Congressman Robert Lagomarsino and also included California Assemblyman Gary Hart and officials of the Santa Barbara city government. The NMFS exhibit was manned throughout the day by Mr. Raymond and Mr. Charles Hill, head of Scientific Services at the La Jolla Laboratory. This is the second year that NMFS has participated in the Fishermen's Festival.



Visitors to 5th annual fishermen's festival view NMFS exhibit.

Tiburon Excess Property Consigned to Department of
Health, Education and Welfare for Release to San
Francisco State University

Written confirmation from both GSA and HEW has been reviewed that the excess property of the Tiburon Laboratory consisting of 35 acres of land with various types of structures has been officially transferred to San Francisco State University and that responsibility for care, custody, and maintenance for that property now rests with the University. Agreements will be negotiated as soon as possible for either cost sharing or separate maintenance of sewer plant operations and road and utility easements and security of the entire facility.

- May 4 and 6 - Mr. Lester Knapp and students from Palomar College visited the SWFC Center at La Jolla. Ms. Betsy Stevens presented a talk on the research activities and later toured the group through the Center facilities.
- June 9 - Mr. Uchida escorted Senator Paul Bordallo of Guam to the Hawaii Division of Fish and Game's Anuenue Station (shrimp mariculture), Oahu Fish Market, Hawaiian Tuna Packers, the International Center for Living Aquatic Resources Management, and our Kewalo Research Facility.
- 18 - Mr. Carl Miller, Instructor at Carlsbad High School and 25 students visited the Center. Fishery Biologist James Coe was the host and lecturer for the group.
- The following press release was issued by the SWFC's Honolulu Laboratory, "Tracking Tagged Skipjack."

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Research Assistant Ray Sumida packed and shipped two fresh skipjack tuna to Dr. W. Brown, University of California at Davis, for use in histamine studies.

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Fishery Biologist Richard Uchida spent some time discussing with Messrs. Craig China and Carl Onouye, senior students from McKinley High School, their research project on the aku fishery in Hawaii.

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During the gear shakedown phase on May 3 and 4 of the Townsend Cromwell cruise, two 1-day trips off the coast of Oahu carried University of Hawaii fishery science students and Honolulu Laboratory personnel who are not usually among the "sea-going." Activities for each day included a shrimp trawl haul on Penguin Bank, an Isaacs-Kidd midwater trawl haul, an STD drop, an XBT drop, trolling, and a plankton tow.

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Skipjack and turtle tag notification posters received from the Ministry of Natural Resources, Fisheries Division, British Solomon Islands Protectorate, were distributed to the Hawaii Division of Fish and Game, Hawaiian Tuna Packers, and United Fishing Agency.

Tiburon Laboratory Hosts Multiple-Species Fishery Colloquium

Participants in a colloquium on the "Multiple-species fishery problem," held June 8-11, 1976 at the Tiburon, California Laboratory of the National Marine Fisheries Service, Southwest Fisheries Center, included scientists from NMFS and several fishery and academic organizations.

Shown (from left) are: Mr. Peter B. Adams, Tiburon Laboratory, SWFC; Dr. William H. Lenarz, Tiburon Laboratory, SWFC; Dr. Virgil J. Norton, University of Rhode Island; Dr. William W. Fox, Jr., La Jolla Laboratory, SWFC; Dr. Loh Lee Low, Northwest Fisheries Center, NMFS; Mr. Norman J. Abramson, Tiburon Laboratory, SWFC, Convenor of the Colloquium; Dr. Carl J. Walters, University of British Columbia; Mr. Patrick K. Tomlinson, Inter-American Tropical Tuna Commission; Dr. Edmund S. Hobson, Tiburon Laboratory, SWFC; Dr. Albert V. Tyler, Oregon State University; Mr. Roy Mendelssohn, Yale University; Dr. Robin Allen, Inter-American Tropical Tuna Commission; Dr. Norman J. Wilimovsky, University of British Columbia.



Participants in a colloquium on the "Multiple-species fishery problem"

The multi-species problem deals with the ramifications of harvesting fish or other aquatic animals from the multiple-species aggregations. The purpose of this colloquium was to gather together researchers to review current ideas on important topics, and to produce written documents containing recommendations for future research. Several draft documents were produced as a result of the colloquium and will be compiled into one final report.

HONORS AND AWARDS

- June 13 - Maxwell B. Eldridge, Fishery Biologist, Quality Step Increase, Tiburon Laboratory.
- Susumu Kato, Fishery Biologist, Quality Step Increase, Tiburon Laboratory.
- 14 - Joseph Caruso, Mathematics Technician, Special Achievement Award, La Jolla Laboratory.
- Oden Burris, Computer Programmer, Special Achievement Award, La Jolla Laboratory.
- Tappy Mulitauopele, Fishery Biologist, Special Achievement Award, La Jolla Laboratory.
- Geoffrey Moser, Fishery Biologist, Quality Step Increase, La Jolla Laboratory.
- Kate Coleman, Secretary, Quality Step Increase, La Jolla Laboratory.
- 22 - At a general staff meeting Director Shomura of the Honolulu Laboratory presented Special Achievement awards to Librarian Hazel Nishimura, Scientific Illustrator Tamotsu Nakata, Editorial Assistant Irene Toyomura, and a Quality Step Increase to Editorial Clerk Elizabeth Young. Physical Science Technician Bernard Ito was also the recipient of a Special Achievement Award, however, he was not present to accept it, having departed on Townsend Cromwell Cruise 72 on June 21.

SEMINARS

Honolulu Laboratory

- June 16 - Mr. Donald J. Stewart, Laboratory of Limnology, University of Wisconsin, spoke on "Distribution and abundance of fishes relative to a thermal front near Cape Hatteras, North Carolina" at the Honolulu Laboratory to Laboratory staff and University of Hawaii students and faculty.

TRAINING

- May 10 - 14 - Roger E. Green, "Accelerated Reading", Civil Service Commission, Tiburon, California.
- 17 - Maureen Woods, "Dialog Training Session", Lockheed Co., Tiburon, California.
- 17 - 19 - A 3-day course entitled "Fundamentals of Data Communications and On-Line Computer Systems" was completed by Sally Kuba, Dr. Robert Skillman, Dr. Jerry Wetherall, and Marian Yong of the Honolulu Laboratory, Honolulu, Hawaii.
- 20 - Pete Benville and Michael Bowers, "Isoenzyme Workshop", Helena Laboratories, Tiburon, California.
- June 1 - 3 - Maureen Woods, Librarian, CSC Course, "Writing Effective Letters", Tiburon, California.

MEETINGS AND TRAVEL

- April 26 - 30 - Dr. R.M. Laurs traveled to Columbia, Missouri, to attend the NMFS/Center for Climatic Environmental Assessment Workshop.
- 28 - 30 - Dr. D. Huppert traveled to Newark, Delaware, to attend a University of Delaware Conference on the Economic Impacts of Extended Fisheries Jurisdiction.

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- May 1 - Mr. R. Shomura departed Honolulu for a meeting with the Pacific Tuna Development Foundation Long Range Program Planning Committee aboard the SS Princess Louise at Terminal Island, California, on May 3. He participated in the review and discussion of proposals for future activities in Hawaii, American Samoa, and the Trust Territory of the Pacific Islands. Under consideration at this meeting were the three projects submitted by Mr. Shomura as possible long-range projects: development of tuna aggregating devices to improve harvesting; field testing of cultured baitfish species; and the development of a pilot baitfish transport system. The Committee recommended funding support of the Honolulu Laboratory's pilot-scale baitfish transport system. On May 4, Mr. Shomura traveled to Tiburon where he discussed the baitfish transport (roll-on/roll-off) project with Director Abramson and Mr. Stan Smith of the Tiburon Laboratory. Mr. Shomura also met with Mr. Chris Fee, Area Personnel Officer, Terminal Island.
- 3 - 5 - Mr. Izadore Barrett, SWFC Acting Director, attended a meeting of NMFS Regional and Center Directors held in Washington, D.C. A major topic of discussion was the role of NMFS in implementing the Fishery Conservation and Management Act of 1976. The meeting consisted, in part, of a series of presentations by the NMFS Extended Jurisdiction Planning Staff concerning the requirements of the Act and related matters.
- 10 - Rear Admiral James W. Moreau, Commander, 14th Coast Guard District, and Lt. Scott J. Anderson called on Mr. Shomura. Together with NMFS Regional Representative Robert Iversen, they discussed their respective roles under extended jurisdiction. Admiral Moreau and Mr. Shomura agreed to hold several meetings, the first in May, in order to provide the Coast Guard with information on fishery activities in the Pacific.
- 11 - 14 - Acting Center Director Barrett traveled to Seattle for the West Coast Regional/Center Directors' meeting.

- 12 - Mr. Shomura attended the Marine Technology Advisory Committee Meeting sponsored by Leeward Community College. Dr. Mary Naughton, Dean of Educational Services, welcomed participants. Status and progress reports of the LCC program were presented by the staff, followed by an open discussion of the implications and impact of the Marine Technology Program.
- 17 - Mr. Shomura attended an informal meeting called by the Director of the Division of Fish and Game, State of Hawaii, on harvesting of precious coral in local waters. Harvesting precious coral in Federal waters (3-9 miles offshore) is at present a Federal offense. The meeting was called because a local fishing vessel was reported to be harvesting precious coral. The meeting was attended by industry members, a representative of the U.S. Fish and Wildlife Service, the Marine Coordinator's Office, State of Hawaii, and Hawaii State Fish and Game personnel.
- 18 - 22 - Fishery Biologist Eric Barham in Long Beach to conduct multi-spectral photographic tests of porpoise schools in collaboration with fisheries engineering laboratory personnel.
- 19 - 20 - Mr. Shomura participated in the annual Sea Grant site visitation at the University of Hawaii.
- 20 - CalCOFI Committee meeting held at the Southwest Fisheries Center. Attended by Mr. Barrett with participation by Drs. Lasker, P. Smith, and G. Stauffer.
- 21 - Mr. Shomura took part in the first annual student Symposium on Marine Affairs, sponsored by the Sea Grant College Program, University of Hawaii, and the State Marine Coordinator's Office, held at the Hilton Hawaiian Village. Mr. Shomura presented a talk on skipjack tuna fisheries to two groups of students. During the afternoon session 12 papers in four categories (aquaculture, coastal zone management, skipjack tuna fishery, and law of the sea issues) were presented by local high school students.
- 24 - 29 - Mr. David Mackett in Mexico City for U.S. Mexican fishery negotiation meeting.
- 26 - 27 - Dr. W. Fox traveled to Washington, D.C. to attend meeting announcing level of porpoise mortality for 1976.

- 27 - Honolulu Laboratory staff members Mr. Shomura, Dr. Richard Barkley, and Dr. Paul Struhsaker, and Regional Representative Mr. Iversen attended a meeting at the 14th Coast Guard District office to discuss fish and fisheries of the Pacific Ocean.
- 28 - Dr. Edmund Hobson traveled to Ithaca, New York, to attend a symposium on fish community structure at Cornell University. Dr. Hobson presented a talk on fish communities in southern California kelp forests.
- June 1 - 3 - Norman J. Abramson traveled to SWFC, La Jolla, to attend Center Management Meeting.
- 1 - 4 - Honolulu Laboratory Director Richard Shomura was on travel status to attend the quarterly Center Management Meeting at the SWFC, La Jolla, June 2-3. Topics discussed were (1) NMFS reorganization, (2) extended jurisdiction, (3) budget, (4) marine mammals, (5) otolith reading, (6) vessel utilization, and (7) overtime pay. Subsequent to the quarterly meeting, Mr. Shomura reviewed the status of the roll-on/roll-off baitfish project at the Tiburon Laboratory.
- 2 - Ms. Dorothy Roll traveled to San Francisco to attend a conference on ADP procurement in the federal government.
- 3 - Dr. G. Stauffer was in Long Beach to attend the California Department of Fish and Game's presentation of the anchovy management plan to sportmen groups.
- 3 - 4 - Dr. R. M. Laurs was in Portland, Oregon to complete arrangements for the albacore port sampling program with state fisheries people from Washington, Oregon, and California.
- 3 - 12 - Dr. William Perrin traveled to Washington, D.C. to work at the Smithsonian Institution, and thence to London, England to participate in a meeting of the International Whaling Commission Subcommittee on Small Cetaceans and to work at the British Museum.
- 7 - 12 - Dr. H. Geoffrey Moser and Dr. John Hunter attended the annual meeting of the American Society of Ichthyologists and Herpetologists held at the University of Alaska in Fairbanks. Dr. Moser presented a paper which summarized reproduction in the kelp fishes of the family Clinidae with special emphasis on the live-bearing (viviparous) members of this family of fishes and Dr. Hunter gave a paper titled the "Diel rhythm in swim bladder inflation in the northern anchovy."

- 8 - 11 - Mr. I. Barrett attended a meeting in Honolulu, Hawaii, with state directors, who will be appointed to the Western Pacific Council.
- 9 - Jeannette Struhsaker and Mickey Eldridge traveled to Elk Grove hatchery to artificially fertilize and transport striped bass eggs from the California Department of Fish and Game.
- 9 - 10 - Pete Benville attended the American Society of Biological Chemists instrument show in San Francisco. He also visited many other places in the Bay area in an effort to buy the instruments we will need for the oil research.
- 13 - 18 - Dr. R. M. Laurs traveled to Missoula, Montana, to present a paper entitled, "Small-scale movements of albacore, Thunnus alalunga in relation to ocean features", at the meeting of the American Society of Limnology and Oceanography.
- 14 - Mr. J. Caruso, Mathematical Technician, traveled to Long Beach to attend the State/Federal Cooperative Research program meeting.
 - Mr. Sam Pooley of the Department of Planning and Economic Development, State of Hawaii, met with Mr. Shomura to discuss the Pacific Tuna Development Foundation (PTDF).
- 14 - 16 - Mr. David Mackett traveled to Washington, D.C. to attend a meeting on Extended Jurisdiction.
- 15 - Dr. Gary Stauffer traveled to Long Beach to attend a State Anchovy Planning meeting.
- 16 - 19 - Dr. Reuben Lasker traveled to Savannah, Georgia, to attend a National Science Foundation workshop on secondary production.
- 18 - Susumu Kato traveled to Avila Beach with two fish buyers to investigate possibilities of utilizing small rockfish and flatfish normally discarded by commercial trawlers. Samples of various species were obtained through Olde Port Fish Co. and transported to San Francisco. A survey of seven fish markets in Chinatown indicated low acceptability of small fish, even at low prices. Specimens of splitnose rockfish which are thought to have characteristics appealing to the Japanese market were air-freighted to Japan for appraisal.

- 19 21 - Pete Adams and Bill Lenarz traveled to Monterey to participate in the California Department of Fish and Game's Alaska cruise and to discuss rockfish studies.
- 21 - Mr. Douglas Souter, Living Marine Resources, San Diego, met with Mr. Otsu to discuss fishery matters. Mr. Otsu provided Mr. Souter with the most recent fishing condition charts (June 1975-May 1976) for the Japanese southern water skipjack tuna fishery. Several sets of the same charts were also given to Southwest Regional Representative Robert Iversen to hand out to the U.S. Coast Guard, U.S. Navy, etc. These charts, along with a narrative description of the fishing conditions, were received from Japan in late June and will be distributed as soon as Mr. Otsu completes the translation of the text.
- Mr. Shomura attended a meeting with Messrs. Michio Takata and Kenji Ego, Hawaii Division of Fish and Game, to discuss the survey of the Northwestern Hawaiian Islands. He then attended a luncheon meeting called by Mr. Andrew Gerakas, Chairman-President, PTDf.
- 21 - 23 - Dr. Reuben Lasker attended the American Society of Limnology and Oceanography meeting in Savannah, Georgia, where he presented a paper entitled, "Major upwelling in the southern California Bight may be detrimental to larval anchovy survival."
- 28 - Mr. Satoru Nakamura, Japan Marine Fishery Resource Research Center, discussed with Messrs. Otsu and Walter Matsumoto the recent purse seining results of the Nippon Maru in waters off Samoa, Gilbert Islands, etc.
- 28 - 29 - At the invitation of Dr. Brian Rothschild, Acting Director of the Extended Jurisdiction Program Office, Mr. I. Barrett traveled to Washington, D.C. to participate along with Dr. D. Alverson, Mr. H. Bullis, Dr. R. Edwards and Dr. Rothschild in the preparation of a program statement on a national research program in fisheries, particularly as it relates to extended jurisdiction. The resulting draft document will then be reviewed with all Center and Laboratory Directors.
- 30 - Messrs. Otsu and Uchida attended a meeting called by Dr. Tommy Nakayama of the Department of Food Science and Technology, University of Hawaii, to discuss histamine in skipjack tuna and problems of honeycombing. The meeting was held at the Hawaiian Tuna Packers office.

- Mr. Barrett attended a Sea Grant/National Marine Fisheries Service meeting in Burlingame, California on extended jurisdiction, whose purpose it was to discuss the role of Sea Grant/National Marine Fisheries Service in support of extended jurisdiction - Pacific Regional Council.

VISITORS

Honolulu Laboratory

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| May | 3 | - Mr. Akio Nakamura, Experimental Chemist, Division of Food Hygiene, Osaka Prefectural Hygienic Research Institute, Osaka, Japan. |
| | 5 | - Dr. Donald P. Martineau, Deputy Associate Administrator for Marine Resources, NOAA, Rockville, Maryland. |
| | 14 | - Mr. J. S. Campbell, General Manager, Fishing Industry Board, Wellington, New Zealand. |
| | 18 | - Mr. Jack Karukuru, Deputy Secretary, Department of the Prime Minister of Papua, New Guinea, accompanied by Mr. Edward A. Karnacki, Deputy Director, U.S. Department of State, Honolulu. |
| June | 3 | - Dr. Ledoph Baer, Director, Oceanographic Services Office, Office of Associate Administrator for Environmental Monitoring Prediction, NOAA; Mr. Archie Ginn, Office of Programs and Budget, NOAA; and Lt. Cdr. Pedro Cabezas, Instituto Oceanografico, Ecuador. |
| | 8 | - Mr. Eliakim Tobolton, National Investment and Development Authority, Papua, New Guinea. |
| | 10 | - Mr. Koh, Dong Jae, Fisheries Officer and Consul, American Samoa. |
| | 16 | - Mr. Koh revisited the Laboratory and met with Mr. Otsu to discuss general fisheries problems. |
| | 17 | - Mr. James P. McVey, Trust Territory of the Pacific Islands, Koror, Palau. |
| | 21 | - Mr. T. Koraea, National Parliament, Papua, New Guinea, accompanied by Mr. Kendall Ellingwood, Jr., of the U.S. State Department Reception Center. |

- 22 - Mr. Dick Darling, President, Palau Fisheries Ltd., Koror, Palau.

La Jolla Laboratory

- May 1 - 8 - Messrs. Willie Ross of NOAA and Gordon Baskerville, NMFS Systems Analyst, at the Center to meet with David Mackett, Planning Officer on ADP feasibility studies.
- 3 - Dr. Robert Skillman, Honolulu Laboratory, Honolulu, Hawaii.
- 6 - Dr. Roy E. Marten, National Fisheries Institute, Washington, D.C.
- Mr. Tom Billy, NMFS, Washington, D.C.
- Mr. Robert W. Schoning, Director, National Marine Fisheries Service visited the Southwest Fisheries Center and spoke at a general staff meeting. Mr. Schoning explained the planned reorganization of the National Marine Fisheries Service in response to meeting the needs of extended jurisdiction.
- 7 - Ms. Rozanne Ridgway, Deputy Assistant Secretary of State for Oceans and Fisheries Affairs. Ms. Ridgway who has the responsibility for State Department negotiations with Mexico with regard to extended jurisdiction held informal discussions with the senior scientific staff during her brief visit.
- Mr. Hale Lopes, NOAA Personnel Division, Rockville, Maryland.
- 10 - Mr. Tadashi Yamamoto, FAO, UNDP, Jakarta, Indonesia.
- 19 - Mr. Frank Wittmann, NMFS, Bay St. Louis, Mississippi.
- Mr. A.A. Caldwell, NASA, Bay St. Louis, Mississippi.
- 19 - 20 - Mr. Richard Hagemeyer, Staff Assistant, Office of Programs and Budget, NOAA, Washington, D.C.
- 20 - Mr. Don Aasted, Honolulu Laboratory, Honolulu, Hawaii.
- 21 - Mr. Ron Keir, FAO Project Manager, Mexico City, visited the Center.
- 27 - Mr. William Pichel, NOAA/NESS, Suitland, Maryland.
- Mr. Gene Parro, Lane Community College, Eugene, Oregon.

- 28 - Mr. Millard Burr, State Department, Geography Division, at Center to discuss source of resource information in preparation for border negotiations.
- June 2 - 3 - Messrs. Richard Shomura and Norman Abramson, Director of the SWFC's Honolulu and Tiburon Laboratories, respectively, in La Jolla to attend the Center Management meeting.
- 7 - 10 - Dr. Colin W. Clark, CSIRO, Division of Fisheries and Oceanography.
- 9 - Mr. David H. Barbour, British Columbia Parks Federation, Richmond, B.C.
- 14 - Mr. Chao-Chin Chen, Fisheries Division, Taiwan, Formosa, visited the Center to discuss remote sensing techniques.
- Mr. Flaubert Zuniga, Ministry of Natural Resources, Quito, Ecuador and Mr. Simon Perez, Direccion General de Pesca, Ecuador.
- 17 - Mr. Herb Stern, Operations Officer, Northeast Fisheries Center, Woods Hole Massachusetts.
- 24 - Mr. Kabua, Marshall Islands here to meet with Mr. Barrett and Dr. Sakagawa.

Tiburon Laboratory

- May 3 - Bill Shaw, NOAA, Office of Sea Grant, Washington, D.C.
- 4 - Richard S. Shomura, Director, Honolulu Laboratory, SWFC, Honolulu, Hawaii.
- 5 - James O. Keith, Patuxent Wildlife Research Center, Laurel, Maryland.
- 6 - K. Takayama, Western Concept Ltd., San Francisco, California.
- 11 - Chief Buscher, Tiburon Fire District, Tiburon, California.
- 13 - Bob Iversen, NMFS, Southwest Region, Honolulu Representative, Honolulu, Hawaii.
- 17 - Helen Gibbons, U.S. Geological Survey, Palo Alto, California.
- 21 - Wesley Homer and V. Thakorg, HOK Associates, St. Louis, Missouri.
- 25 - Don Aasted NMFS, Honolulu Laboratory, Honolulu, Hawaii.
- Chris Jones, Department of Fisheries, Brennon, Washington.

- 26 - Robert Schoner, Marine Program Leader, National Weather Service, Silver Spring, Maryland.
- Marvin Hofer, National Weather, Service, Oakland, California.
- 28 - N.K. Temnikov and T.A. Kauffman, California Aquaculture, Woodland, California.
- June 7 - Robin Allen and Patrick Tomlinson, Inter-American Tropical Tuna Commission, La Jolla, California.
- William Fox, SWFC, La Jolla, California.
- Roy Mendelssohn, School of Forestry and Environmental Studies, Yale University, New Haven, Connecticut.
- Virgil Norton, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.
- Albert Tyler, Department of Fisheries and Wildlife, Oregon State University, Newport, Oregon.
- Carl J. Walters, Institute of Animal Resource Ecology, University of British Columbia, Vancouver, B.C.
- Norman Wilimovsky, Institute of Animal Resource Ecology, University of British Columbia, Vancouver, B.C.
- Loh Lee Low, NWFC, NMFS, Seattle, Washington.
- 9 - O.F. Deland, San Francisco State University, San Francisco, California.
- Jonathan Anson, U.S. E.P.A., Washington, D.C.
- 11 - Lee Booker, Marin County Fire Department, Sausalito, California.
- 14 - Lee Benson, University of California Co-op. Extension, University of California, Berkeley, California.
- Bruce Wyatt, University of California Co-op Extension, University of California, Berkeley, California.
- 22 - Ken Takayama, Western Concept Ltd., San Francisco, California.
- 23 - Norman Mendes, NMFS, San Diego, California.

- 24 - Zeke Grader, Ocean Traders Inc., Sausalito, California.
- 25 - J.S. Tanaka, Nissei Sanyyo, Mt. View, California.
- 30 - Richard Everett, Oceanic Society, Fort Mason, San Francisco, California.

PERSONNEL

			<u>Laboratory</u>
May	4	- Walter Ikehara, Biological Aid, Temporary Appointment.	Honolulu
		- Becky Donlan, Clerk-Typist, Pay Adjustment to Part-Time.	La Jolla
		- William Walker, Biological Technician, Termination.	La Jolla
		- Jonathan Halas, Biological Technician, Termination.	La Jolla
	5	- Joseph Caruso, Mathematical Technician, Termination.	La Jolla
	23	- Dr. Jeannette Struhsaker, Promotion.	Tiburon
	24	- Nancy La Roche, Secretary, Promotion.	La Jolla
June	10	- Chris Psaropulos, Computer Programmer, Extension of Appointment.	La Jolla
	14	- Ken Brennecke, Mathematical Technician, Extension of Appointment.	La Jolla
	16	- Ed Jameyson, Biological Technician, Termination.	La Jolla
	17	- Ken Brennecke, Mathematical Technician, Pay Adjustment.	La Jolla
		- Gary Friedrichsen, Biological Technician, Termination.	La Jolla
	21	- Sharon Hendrix, Student Assistant, Pay Adjustment.	La Jolla
		- Thomas G. Yocom, Fishery Biologist, Temporary Appointment. (Transfer from U.S. Fish and Wildlife Service, Ann Arbor, Michigan).	Tiburon
	22	- John Butler, Biological Technician, Career-Conditional Appointment.	La Jolla
		- Barbara Sumida, Biological Technician, Career-Conditional Appointment.	La Jolla
	25	- Walter N. Ikehara, Biological Aid, Termination of Temporary Appointment.	Honolulu

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